

INDIAN DRAGONFLIES

BY

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Part XXIII

(With 1 plate and 3 text-figures)

(Continued from page 857 of Vol. XXX.)

Genus—CYCLOGOMPHUS Selys

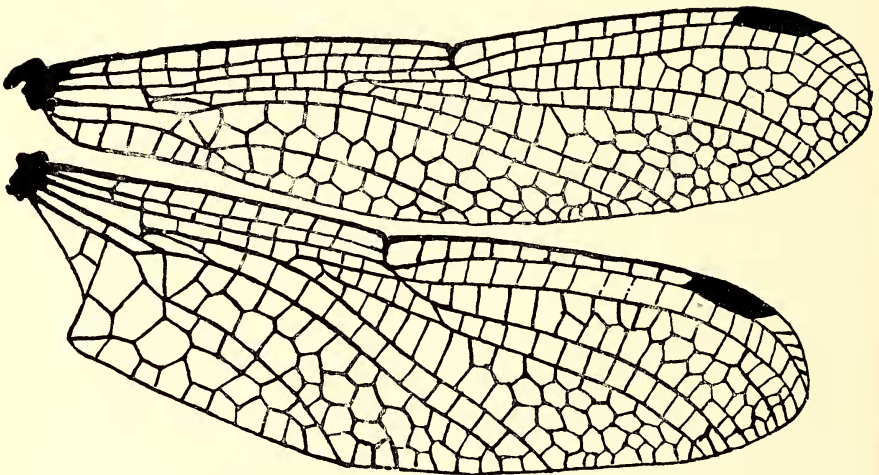


Fig. 1—Wings of *Cyclogomphus ypsilon* (Selys). Male

Insects of rather small size but of robust build, breeding in running water or marshy sources of streams.

Venation. Wings moderately long and broad, base of hind rather deeply concave; costa brightly coloured; pterostigma relatively long, nearly one-third the length of distance between node and distal end of pterostigma, braced; an incomplete basal antenodal nervure in all wings (very rarely absent in one or more wings); arc between the 1st and 2nd antenodal nervures; sectors of arc parallel for some distance, not approximated near origin; 1 cubital nervure in all wings; 1 row of postanal cells in forewing 4, occasionally 3 in the hind, 1st postanal cell in latter entire, extending basal for only slightly more than one-third the length of subtrigone; 2 transverse nervures between *Mi-iii* and *Miv* in the forewing, only 1 in the hind; forking of *Mi-ii* and *Miii* symmetrical in all wings; 1 row of cells between *Mi* and *Mia*; 3 rows of discoidal cells in forewing at level of node; 2, or more rarely 3 rows of cells posterior to *Cuii* in forewing, this nervure convex and inclining to pectination. Trigone in hindwing relatively long, its costal side about one-third longer than the basal, entire.

Head less narrow and less widened than in *Heliogomphus*, triangular as seen from above.

Legs robust, moderately long, the hind femora extending slightly beyond the base of 2nd segment, armed in both sexes with two rows of moderately widely spaced, short, fine spines, but more numerous in the male.

Abdomen short and robust, segments 1 and 2 tumid, segments 3 to basal half of 7 narrower and cylindrical, apical half of 7 and segments 8 and 9 widely dilated, 10 very small and narrow.

Anal appendages. Superiors apposed, shorter than segment 10, sub-cylindrical. Inferior deeply bifid, its branches widely divaricate and armed near the apex with a robust spine. Vesicle of penis enormously swollen, globular.

Vulvar scale rudimentary, two small triangular processes at the ventro-apical border of the 8th segment.

Distribution. India, Burma and Ceylon. *C. heterostylus* Selys, *ypsilon* Selys, *vesiculosus* Selys, *verticalis* Selys and *wilkinsi* sp. nov. are from Continental India, *C. minusculus* Selys is from Burma, whilst *C. gynostylus* sp. nov. is from Ceylon.

Of these *C. vesiculosus* appears to be merely a small specimen of *ypsilon*, whilst *verticalis* is evidently not a *Cyclogomphus* at all, but more probably a *Microgomphus*.

Genotype—*Cyclogomphus ypsilon* Selys,

Cyclogomphus ypsilon Selys, Bull. Acad. Belg., xx. (2) p. 62 (1864); id. Mon.

Gomph. pp. 107, 406 (1857); Kirby, Cat. Odon., p. 69 (1890); Will. l. c. p. 297 (1907); Laid. l. c. pp. 390-391 (1922). Fras. l. c. p. 475 (1924)

Male. Abdomen 30 mm. Hindwing 27 mm. (Fig. 1.)

Head. labium yellow, its middle lobe bordered with black; labrum, ante- and post-clypeus greenish yellow, the former with very fine bordering and basal black; frons above and in front greenish yellow with a fine transverse black stripe along its lower border in front, and a narrow basal border above, rather more extensive in the middle line; vertex black; occiput pale yellow, simple; eyes bottle green, yellow below and behind, glossy black above and behind.

Prothorax black with a geminate spot on the middorsum of the posterior lobe and a large yellow spot on each side.

Thorax black and greenish yellow as follows:—two broad black medio-dorsal stripes narrowly separated by the finely yellow carinal crest, which is itself confluent below with a broad yellow complete mesothoracic collar, the yellow thus forming an inverted 'Y', which gives the insect its name. The two black bands widely confluent above through the medium of the black alar sinus and also outwardly with a broad black humeral stripe which crosses the humeral suture rather obliquely and encloses a small yellow spot above the upper part, thus being split into two arms and forming an upright 'Y'. Laterally a vestigial fine black stripe on the upper part of the first lateral suture, and a complete black stripe on the second lateral suture.

Legs bright yellow marked with black, the tibiae and tarsi black, but the hind tibiae with a small spot of yellow on the distal end of the flexor surface; hind femora with an inner and outer stripe, broad and confluent distal, rapidly tapering and ending well before the basal end, middle and anterior femora entirely black on the outer side.

Wings hyaline or in old specimens evenly enfumed; pterostigma pale brown, or in some specimens of the male sex, brown at the centre, pale at either end, and well-braced, over 3 to 4 cells; nodal index very variable:— $\frac{8-11}{7-9} \frac{11-8}{9-8}$,

$\frac{9-14}{10-11} \frac{12-9}{11-9}$; 4 postanal cells in hindwings.

Abdomen black marked with greenish yellow as follows:—Segment 1 almost entirely yellow, a fine basal bordering of black broadening very slightly sub-dorsally; segment 2, including the large oreillets, yellow with broad longitudinal subdorsal black stripes which enclose a middorsal bilobed spot, the black broadening at the level of the transverse suture and almost confluent with that of the other side; segment 3 similar to 2, the black however confluent at the apical border of segment and almost so at the level of the transverse suture, thus cutting the dorsal yellow into a smallish basal spot and a much larger apical spot; segments 4 to 6 with the subdorsal black stripe not extending nearly to base of segments, there being a broadish yellow complete ring here, at the apex of segments the black broadly confluent over the dorsum, and almost equally so at the transverse sutures; segment 7 similar, but the black stripe of even width at the transverse suture and not nearly confluent, at the apical border only

slightly confluent; segment 8 similar but the black subdorsal stripe broader and extending almost to base of segment; 9 similar but the black stripes well separated throughout their entire length; 10 almost entirely black with a small arrowhead-shaped mark on the dorsum and the ventro-lateral borders narrowly.

Anal appendages. Superiors Libelluline-shaped, almost equal in length to segment 10. Seen from the side cylindrical in the basal half, broadened in the apical half, the extreme apex curved up, the stem of the appendage curved down, the broadened part expanded below into a robust blunt tooth. Seen from above, the appendages are thickened at the extreme base, then constricted and again considerably dilated and finally tapered to an acute point. These appendages moderately closely apposed, enclosing a small foramen between their stems, yellow.

Inferior appendage nearly one-third longer, deeply bifid, the branches widely divaricate, more slim than the superiors, bluntly acute at the apices, tapering, presenting a large blunt tooth at the middle third which is directed down and somewhat inwards, yellow changing to black in the outer half.

Genitalia prominent: lamina depressed, hamules very large, projecting almost perpendicularly from the genital sac, the apices directed slightly forward, pale yellow; vesicle enormously swollen, pyriform, globular, overlapping the basal third of the third abdominal segment, greenish yellow surmounted by a black penis.

Female similar to male, differing only as follows:—Usually larger, abdomen 32 mm. hindwing 29 mm; nodal index as variable as in the male:—

7-12|11-9 9-12|12-10 10-12|12-9
8-9 |9-7' 9-12 |9-9' 9-8 |8-9'

The basal marking on segment 1 broader, segments 2 to 3 similar, 4 to 7 with the black broadly confluent over the dorsum, at the transverse suture and apical border, thus enclosing long oval yellow spots, segment 10 broadly yellow on dorsum.

Vulvar scale small and rudimentary, two tiny triangular processes in close apposition at the base of segment 8, followed immediately afterwards by two raised folds on the ventral aspect of segment 9 which are widely divaricate, and the function of which is unknown.

Habitat. Central India and the Deccan. Type, a male in the British Museum, a paratype in the Selysian collection is labelled 'Cuna', but this is obviously an error for 'Guna', in the Central Provinces, India.

I found this insect moderately plentiful in the marshland at the head of the Katraj Lake, near Poona, Deccan. It rests in long grass and has to be put up by beating. Its flight is short and weak and it falls an easy prey to the collectors net.

Cyclogomphus heterostylus—Selys (*C. heterostyla*) Bull. Acad. Belg. xxi (2) p. 62 (1854), (*C. heterostylus*) Mon. Gomph. p. 106 (1857); Bull. Acad. Belg. (2) xxxv., p. 757 (1873); Kirby, Cat. Odon., p. 69 (1890); Will. l. c. p. 297 (1907); Laidl. l. c. p. 391 (1922); Fras, l. c. p. 474 (1924).

This species is very similar to the last. The differences indicated in the Selysian description, on examination of a large number of specimens, are found to break down largely. Thus no dependence can be placed on the nodal index, which varies widely in this as in *ypsilon* and *wilkinsi*. The bicolourous character of the pterostigma is also found to be shared by adult specimens of *ypsilon*. Size also is a very variable factor and absolutely no reliance can be placed on it. Other minor differences given by Dr. Hagen are also unimportant. The only reliable characters which I have been able to find are the following:—

Transverse black stripe on lower part of frons distinctly thicker; labrum entirely yellow; the stripe on first lateral suture of thorax oblique and confluent at an angle with the stripe on the second lateral suture, so as to form a second black 'Y' on the sides. Finally the anal appendages present some differences:—the superior are more closely apposed and their apices are turned out as well as down, the inferior are relatively much longer, the branches being stouter and tapering more gradually, the tooth at the middle third is smaller, more acute and directed straight up. In spite of these differences, I should be inclined to regard *heterostylus* as a mere race of *ypsilon* were it not for the fact that the two species are found in company at Poona.

Distribution. Katraj Lake Poona, Deccan and Madras, in marshes along the course of the Coomb River. The type, Saunders' collection, comes from the

North of India, locality not stated. Habits similar to those of *ypsilon*, and like it, found on the wing during September and October.

Cyclogomphus vesiculosus—Selys, Bull. Acad. Belg. (2) xxxvi, p. 300 (1873); Kirby, Cat. Odon., p. 68 (1890); Will. l.c. p. 297 (1907); Laid. l.c., p. 390 (1922).

This species so closely resembles *ypsilon* that I am unable to find any characters serving to separate the two species. The size is said to be smaller (abdomen 25 mm. hindwing 23 mm.), but this factor is so variable in other related species, that no weight can be attached to it. The legs are described as 'more lined with yellow', but this also depends on the age of the specimen.

Unfortunately the type, an imperfect male (the last 5 abdominal segments missing), which was in the Moore collection, appears to have been lost, I therefore prefer to regard it for the time being as an unusually small specimen of *ypsilon*.

Distribution. India, locality not given.

Cyclogomphus wilkinsi sp. nov.

Male. Abdomen 34 mm. Hindwing 28 mm.

Female. Abdomen 35 mm. Hindwing 31 mm.

Head; labium bright citron yellow, the midlobes somewhat greenish; labrum bright citron yellow, its base very narrowly black; face bright yellow with a narrow well-defined black stripe separating the frons from the postclypeus; frons unmarked save for a very fine black basal line; vertex black, occiput bright yellow, flat, a little concave.

Prothorax black marked with an anterior collar of yellow and a middorsal geminate spot and a large lateral spot on each side.

Thorax bright greenish yellow marked vividly with black as follows:—two broad dorsal stripes which taper to a point below and outwards, but converging and confluent above, the complete yellow mesothoracic collar sending a fine carinal prolongation upwards which separates them except near the alar sinus. A humeral black 'Y', the arms of which are of even thickness and of equal length; two lateral narrow black stripes on the lateral sutures, parallel, not extending below the level of the spiracle, finely connected above a bordering line. Unmarked beneath.

Legs bright citron yellow marked with black, the femora almost entirely black within, and with a fine longitudinal black stripe on the outer sides, which in the case of the anterior femora is almost obsolete.

Hind-femora armed with pairs of moderately widely-spaced, fine, short, black spines. Tibial spines short, tibiae with a black stripe on both inner and outer sides.

Wings hyaline, costa bright citron yellow as far as apex of wings, except where the pterostigma intervenes, the latter brown between black nervures, braced, over 4 cells; a basal incomplete antenodal nerve in all wings; nodal

index $\frac{10-11}{10-10} | \frac{14-9}{9-9}$; 1 row of cells between *Mi* and *Mia*.

Abdomen short and tumid, segments 3 to 6 narrower and cylindrical, black marked with yellow as follows:—segment 1 with the sides and dorsum broadly, enclosing a subdorsal stripe of black, 2 similar, the subdorsal black stripes enclosing a trilobed carinal dorsal yellow stripe, 3 very similar but the dorsal yellow stripe more narrow and nearly divided by the fine transverse black suture, 4 to 6 with a basal ring of yellow which is prolonged in a narrow fusiform dorsal stripe to the apical border of segment and laterally for a very short distance along the ventral border, being separated by a considerable interval from an oval lateral spot, 7 similar but the basal ring much narrower and the ventro-lateral oval spot expanding into a broad lateral fascia especially towards the apex of segment, 8 and 9 with a narrow even dorsal stripe running from apex to base and the sides along the ventral border broadly yellow. Segments 8 and 9 and the greater part of 7 laterally expanded as in *heterostylus*. Segment 10 with narrow dorsal ventrolateral yellow stripes. The intersegmental joints from 1 to 7 finely black, the remaining finely yellow.

Anal appendages. Very similar to those of *ypsilon* but the branches of the inferior relatively longer and black from the lateral spine as far as apex. (Figs. 3, 5 and 6).

Genitalia rather more tumid, lamina slightly larger, hamules bright yellow, longer, less recurved (Figs. 3 and 7).

Female. Similar to the male but the black more extensive. The subdorsal black stripes extend basad as far as the extreme base of segments, thus cutting the basal rings into dorsal and lateral spots. Laterally the ventral oval spots are much more extensive and may be actually confluent with the basal yellow or merely separated by a fine prolongation from the transverse suture.

Habitat. Type and allotype of this beautiful dragonfly at present in my own collection but will eventually be deposited in the B.M. One male and two females taken by Mr. Wilkins and myself along the banks of a small stream at Hunse, Mysore, 12-13. x. 1924. All were settled in long grass after the usual habit of species of the genus.

The species is closely allied to both *heterostylus* and *ypsilon* but differs by its larger size, by the continuous dorsal carinal stripes on segments 3 to 7 and more especially by the complete antero-lateral black stripe on sides of thorax (vestigial in the other species). This latter feature will at once serve to distinguish it, as well as other differences in the appendages and genitalia.

In *wilkinsi* the humeral black 'Y' is formed by the confluence of two distinct black stripes, which are invariably finely but distinctly separated by the yellow ground colour, whereas in other species the humeral black stripe is converted into a 'Y' by the interference of a small upper triangular spot, the arms of the 'Y' being very broadly confluent. Lastly the extreme apices of the superior appendages are turned distinctly inward.

***Cyclogomphus gynostylus* sp. nov.**

Male. (Female unknown.) Abdomen 26 mm. Hindwing 23 mm.

Head: labium a dirty yellow; labrum bright citron yellow, its base finely black; ante- and post-clypeus yellow, as also the frons above but the latter traversed by a black stripe along its crest, from which a short tongue of black runs downward; vertex black; occiput dark ochreous, its border straight, fringed with black hairs.

Prothorax black with a geminate spot on the dorsum of posterior lobe and a large lateral spot.

Thorax black marked with greenish yellow as follows:—a complete mesothoracic collar, a small median spot on the dorsal carina, a broad very oblique antehumeral stripe which runs from the neighbourhood of the alar sinus downwards, steadily broadening, a small upper humeral spot which bisects the black dividing the antehumeral stripe from the lateral yellow and converts it into a black 'Y'. Laterally yellow with a broad black stripe on the posterolateral suture which send a short oblique branch forwards at its upper part and so forms a second black 'Y' on the sides.

Legs short, hind femora not extending beyond the apical border of segment one, black but the inner sides of the two anterior femora greenish yellow studded with minute black spines; hinder femora largely yellow clouded with black on the outer sides, these armed with two rows of 7-8 short black robust widely-spaced spines.

Wings hyaline. A single row of postanal cells in the forewing, 4 in the hind; sectors of arc parallel from origin; trigone of hindwing elongate as for genotype; 2 rows of discoidal cells in forewing almost to level of node; 1st postanal cell in hindwing entire and not nearly extending inwards as far as proximal angle of subtrigone; anal triangle of 3 cells; base of wing slightly excavate; pterostigma yellow, swollen, short, braced, over 2-3 cells; a basal incomplete antenodal nervure present in all wings; nodal index

$$\frac{8-11}{8-9} | \frac{13-8}{9-9}$$

Abdomen short, tumid, black marked with yellow as follows:—the sides of segments 1 and 2 including the large swollen vesicle, a lanceolate middorsal stripe on segment 2, the sides of 3, but narrowly broken here at the transverse suture, narrow basal complete rings on 4 to 6, a considerably broader one on 7, occupying rather more than its basal fifth, and expanded along its ventrolateral border as far as its apical border, the sides of segments 8 to 10, on the latter also a confluent basal ring. Segments 7 to 9 are rather dilated.

Anal appendages black, highly specialized. Superiors closely contiguous, rather longer than segment 1, shaped exactly like the ovipositor of a *Calopteryx* seen upside-down, the resemblance being completed by a long spine which springs from each appendage near its apex and is directed back and out.

Viewed from above these spines are a little divaricate. Inferior broadly cleft, its branches widely divaricate, broad, tapering to a point and presenting an outer robust spine near the apex. The superiors curve evenly downward between the divaricate branches of the inferior. Oreillets large, denticulate behind, yellow.

Genitalia very prominent, lamina small, projecting; hamules narrow, long, projecting down, with the apex recurving forward; vesicle of penis of enormous size, globular.

The anal appendages will serve to distinguish it from all other species of the genus (Figs. 3 and 4).

Habitat. A single male collected by Col. F. Wall, I.M.S., Kandy Lake, Ceylon, 2,000 ft. 4. ix. 1924. The specimen is general.

Cyclogomphus minusculus Selys, Bull. Acad. Belg. (2) xlvi. p. 468 (1878); Kirby, Cat. Odon., p. 70 (1890); Will. 1. c., pp. 296-298 (1907); Laidl. 1. c., p. 390 (1922).

Female. Abdomen 22 mm. Hindwing 21 mm. (Male unknown.)

Head. labium yellow; labrum black; rest of face black except for a small spot on each side of the postclypeus; frons yellow along its crest but its base and a prolongation forwards which meets the black on face and front of frons, black; occiput simple, straight, black.

Prothorax black, its posterior lobe yellow.

Thorax black in front and on dorsum, yellow at the sides, marked as follows:—short oblique isolated antehumeral stripes, approximating above, divaricate below, not confluent with the mesothoracic collar of the same colour; laterally a black stripe on the first lateral suture which is confluent at its middle with a similar stripe on the second lateral suture, both stripes moderately thick, the anterior one confluent below with the humeral black stripe.

Wings hyaline, reticulation black, costa finely yellow; pterostigma moderately long, thick, pale between black nervures, over 3 cells (3 mm.); nodal index 9-12/11-10 to forewings.

Legs short, black, inner sides of femora yellow, armed with very short spines.

Abdomen equal in length to the wings, black, brownish beneath, marked and ringed with yellow as follows:—segment 1 yellow with its base narrowly black and interrupted middorsally, 2nd segment with a middorsal trilobed stripe enclosed by broad subdorsal black stripes, the ventro-lateral border yellow marked with a small black spot, the basal articulation finely black, segment 3 black with an interrupted dorsal stripe and a ventro-baso-lateral spot interrupted by the transverse suture, segments 4 to 7 black marked with complete basal rings which occupy about one-sixth the length of segments, remaining segments black, unmarked, 8 and 9 not dilated, 10 very short.

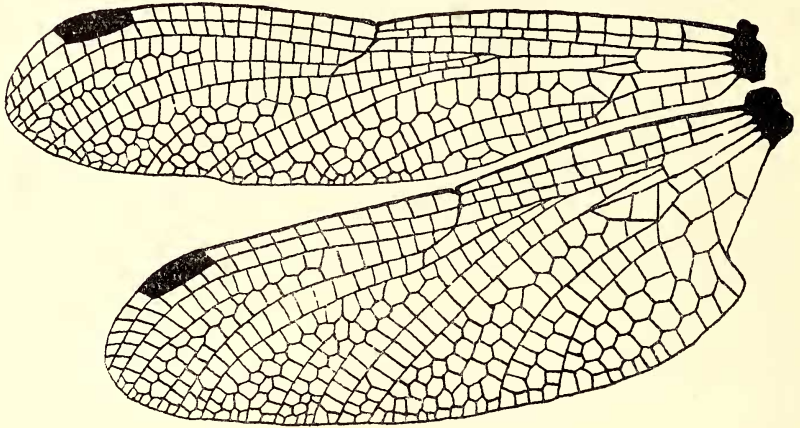
Anal appendages conical, pointed, very small, pale yellow, with a small similarly coloured protuberance between them. Vulvar scale very short.

Distribution. Between Moolai and Moorlut, 4,000-6,000 ft. Tenasserim. A single female in Mr. Wood Mason's collection. Apparently this type was in the MacLachlan collection, as its description was communicated to De Selys by Mr. MacLachlan, but I have been unable to find it in that collection so presume that it has been lost. So long as no details of its venation are known, it will be impossible to place the species with any accuracy.

De Selys gives the following note:—'It is the smallest species of the subgenus (Genus *Cyclogomphus*). It appears to be related to *torquatus* (*Microgomphus*) by the black dorsal carina of the thorax (yellow in all other species). It differs by its smaller size, the absence of a yellow humeral stripe, the narrower mesothoracic collar, which is not prolonged as far as the yellow trochanters of the anterior legs. So long as we do not know the anal appendages of the males of *torquatus* and *minusculus*, there will remain some doubt as to the correct place of these species.' (Note.—The male of *torquatus* has since been described by Laidlaw, *vide supra*).

I think that it is fairly evident that the species is not a *Cyclogomphus*, and the diagnosis appears to rest between *Microgomphus* and Group *modestus* of genus *Onychogomphus*. I am inclined to favour the latter, inasmuch as the armature of the hind femora agrees with that group and not with *Microgomphus*, as does also the length of pterostigma.

Genus—DAVIDIUS Selys

Fig. 2. Wings of *Davidius zollorensis delineatus* subsp. nov. ♂

A large genus of small Gomphines about equal in size to an average *Microgomphus*. Ground colour black with restricted markings of bright or greenish yellow or ochreous; wings moderately long and broad, reticulation close, the base of hindwing in the male very oblique, rounded in the female. Pterostigma short and swollen, about one-fourth the length of distance between node and outer end of pterostigma, braced, but poorly so and at an angle with the oblique inner end of pterostigma; 2 rows of cells in discoidal field of forewing to slightly proximal of line of node; anal loop absent; usually 2 or 3 transverse nervures between *Mi-iii* and *Miv* in forewing, 1 or more rarely 2 in the hind; sectors of arc widely separate at their origin and not afterwards approximated; trigone of forewing sub-equilateral, of the hindwing with costal side much longer than basal (nearly twice the length), distal side distinctly angulated, nearly always traversed by a single nervure which descends from the costal side to the distal, the trigone of forewing more usually entire. Sub-trigones and hypertrigones entire; usually 2 cubital nervures in the forewing, only 1 in the hind; *Cui* and *Cuiv* divaricate in the hindwing, usually 4 cells between their marginal ends; *Cui* in forewing only slightly convex, not pectinate; basal antenodal nervure absent; *Mia* often difficult to define, only 1 row of cells between it and *Mi*; 1 row of postanal cells in the forewing, 3 to 5 in the hind; arc between the 2nd and 3rd antenodal nervures; base of trigone very close to arc in hindwing.

Head rather large and broad; thorax robust but short; legs moderately long, hind femora extending to about the middle of 2nd abdominal segment and furnished with a row of moderately closely-set spines, the distal ones slightly more robust and longer; abdomen relatively short, tumid at base and anal end, intervening segments thin and cylindrical, segments 7 to 9 not winged.

Anal appendages simple or highly specialized. When simple, the superiors divaricate and tapering, the inferior still more divaricate, cleft into two branches which can be seen from above, jutting out on either side from beneath the superiors. When specialized, the superiors with long curling basal branches, projecting downward to lie on the inferior appendage. The inferior cleft to base, its branches closely parallel and projecting from beneath the superiors, armed with a small medial spine on either side.

In some species, segments 7 to 9 with curious tubercles on the ventral surface. Genitalia prominent, the anterior hamules with 2 branches, the tips of which meet to enclose a small foramina, the posteriors much more robust and ending in more or less curled spines. Lobe of penis very tumid and funnel-shaped.

Distribution and habits. Of the fourteen species at present known, eight occur within Indian limits, and are confined to the montane areas of Assam, Bengal and Sikhim. The remaining species are found in Japan, Indo-China, and China. Of the Indian species, I have been able to examine the type of *D. aberrans aberrans*, in MacLachlan collection, *D. aberrans senchalensis* in my own collection, the type of *D. davidi assamensis* in the Indian Museum, the types of *D. malloryi* and *D. kumaonensis* in the Pusa collection, and lastly many specimens of *D. zallorensis delineatus*, including the type. I am again indebted to Messrs. T. Bainbrigge Fletcher and Chas. M. Inglis for generous gifts and loans of material without which this section could not have been written.

Genotype:—*Davidius zallorensis zallorensis* Selys. Regarding this, Selys was of opinion that *aberrans* might prove to be the female of *zallorensis*, but such has not proved to be the case, otherwise *aberrans* would have become the name of the genotype. Kirby gives *davidi davidi* Selys, as the genotype, probably influenced by the fact that the description of *zallorensis* was written by Hagen and copied by Selys. The species however was given priority by Selys, that of *davidi*, a first-hand description by Selys, following after it, Dr. Ris is therefore correct in giving *zallorensis* as the genotype.

The genus is especially interesting, as including in its venation a curious blending of archaic and modern characters. Thus we find an angulate trigone, and in the hindwing, a very much elongated one, which still finds the necessity of a cross-nervure to support it.

The level of the arc is far out. On the other hand, the basal antenodal nervure is absent, and there is a marked reduction in the cross-nervures between *Mi-iii* and *Miv*, which characters bring it into close touch with series *Gomphus*. In habits, the species resemble *Burmagomphus*, which Indian genus is probably nearest akin to it, at least within Indian limits.

Davidius zallorensis zallorensis (Hagen) Selys, *Quatrièmes Additions. au Syn. des Gomph.* App. Bull. Acad. Belg. II, xlvi, p. 75 (1878); Ris, *Sauter's Formosa Ausbeute*, Supplementa Entomologica, No. 5. (1916); Will. Proc. U.S. Nat. Hist. Mus. xxxiii, pp. 286, 287 (1908); Laid. Rec. Ind. Mus. vol. xxiv, pp. 388, 389, (1922).

Male. Abdomen 31 mm. Hindwing 27 mm.

Head. Labium pale yellow; labrum greenish yellow, its extreme base black; face and frons greenish yellow, base of latter above black; vertex and occiput black, a pale median yellow spot on former and the hinder part of the latter the same colour.

Prothorax black, its base and posterior lobe yellow.

Thorax black marked with greenish yellow as follows:—a complete mesothoracic collar confluent with a carinal stripe of the same colour, a narrow sinuous antehumeral stripe dilated abruptly above, a very fine humeral line and an upper point. Laterally entirely yellow save for a narrow black line on the hinder suture.

Legs black, rather long, robust, femora brownish, armed with a row of short spines.

Wings hyaline, a little enfumed in teneral at the base as far as outer end of trigones and along the costa as far as node. Costa black; pterostigma yellowish in teneral, dark brown in the adult, 2.5 to 3 mm. long, over 4 cells, braced poorly; trigone of forewings untraversed; nodal index 8/12—11/10; 3 cells in anal triangle.

Abdomen black marked with yellow as follows:—segments 1 and 2 with a pale yellow middorsal stripe and the sides broadly yellow, segments 3 to 6 with a small baso-lateral and similar apico-lateral spot, borders of 8 and 9 yellowish.

Anal appendages black, the superiors bifid nearly to the base, upper branches divaricate, shorter than half the length of segment 10, apex rounded ending in a short point above, inner branch straight, nearly at a right angle to the outer, inclined abruptly downward, its end curved back slightly towards the base and resting on the inferior appendage. The latter paler, slightly longer, triangular, excavate above, with a transverse tooth on each side, apex blunt and slightly bifid.

Genitalia. Hamules robust, the anteriors long curved spines, posteriors more robust and ending in a tooth which curves inwardly towards its fellow.

Female unknown.

Distribution. Selys gives 'Colony of Zalore', Himalayas, but I have been unable to trace any such place either on ordnance maps or by local inquiries. Type in the Hagen collection.

Davidius zallorensis delineatus sp. nov.

Male. Abdomen 26 mm. Hindwing 25 mm. (Fig. 2).

Head. Labium and labrum glossy black; anteclypeus dirty yellow; mandibles bright citron yellow; face and lower part of frons glossy black; frons broadly yellow above, this colour slightly overlapping the foreborder, its extreme base above narrowly black; rest of head matt black; occiput with sinuous border, fringed with long black hairs.

Prothorax black with a broad anterior collar and a lateral posterior triangular spot citron yellow. Above just in front of the posterior lobe a tiny geminate spot.

Thorax black marked with yellow as follows:—a complete mesothoracic collar, long, narrow antehumeral spots not confluent with the collar below, nor meeting the alar sinus above, oblique and converging above. A small but prominent upper humeral spot and the sides broadly yellow. The hinder suture is narrowly mapped out in black and there is a vestigial similar line on the anterior suture broadly interrupted in its upper part.

Legs black, unmarked, the hinder femora with a row of moderately closely-set robust spines, the distal ones the larger; tibial spines short.

Wings hyaline, the bases bright saffron as far out as halfway from base to node. Pterostigma palest brown framed in darker brown, short and dilated, over 3 cells, poorly braced as a rule; trigones of forewing entire, traversed once in the hind, very rarely entire in one or the other hindwing; only 1 cubital nerve in all wings; 4 to 5 rows of postanal cells in hindwing; usually only 2 nervures between *Mi-iii* and *Miv* in the forewing, and only 1 in the hind.

Abdomen black marked with yellow as follows:—segment 1 with the sides broadly yellow, 2 with the dorsal carina very finely and two large subtriangular lateral spots nearly confluent with each other, the basal one of which involves the oreillet; segment 3 with a large triangular baso-lateral spot narrowing apicad where it is limited by the jugal suture. Apicad to the jugum is a narrow elongate subapical spot, segments 4 to 8 with a small baso-lateral and a similar apico-lateral spot on each side which become progressively smaller from 4 to 8, remaining segments unmarked.

Anal appendages black, highly specialized. Superiors split into two branches almost as far as base, a superior branch tapering and conical, and about equal in length to segment 10, an inferior which springs from beneath the base of the former and is directed straight down and a little in, long and spatulate, slightly curled. Inferior appendage split as far as its base so as to appear as two separate appendages which are divaricate, tapering and equal in length to the upper branch of the superiors.

Genitalia similar to that of *zallorensis zallorensis*. Lamina very depressed, bulb of penis funnel-shaped, notched at its lip, very prominent.

Female. Abdomen 27 mm. Hindwing 27 mm.

Almost exactly similar to the male. The yellow markings of abdomen more extensive, the yellow on the sides of segment 2 confluent, that on 3 only narrowly divided by the jugal suture, on segments 4 to 6 an additional spot at the basal side of the jugal suture and a similar narrow linear spot placed subapically as on segment 3 of the male.

Nodal index $\frac{13-13}{11-8} \frac{14-11}{9-10}$. (In the male $\frac{12-14}{10-9} \frac{13-12}{8-10}$. Venation) otherwise exactly similar to that of male.

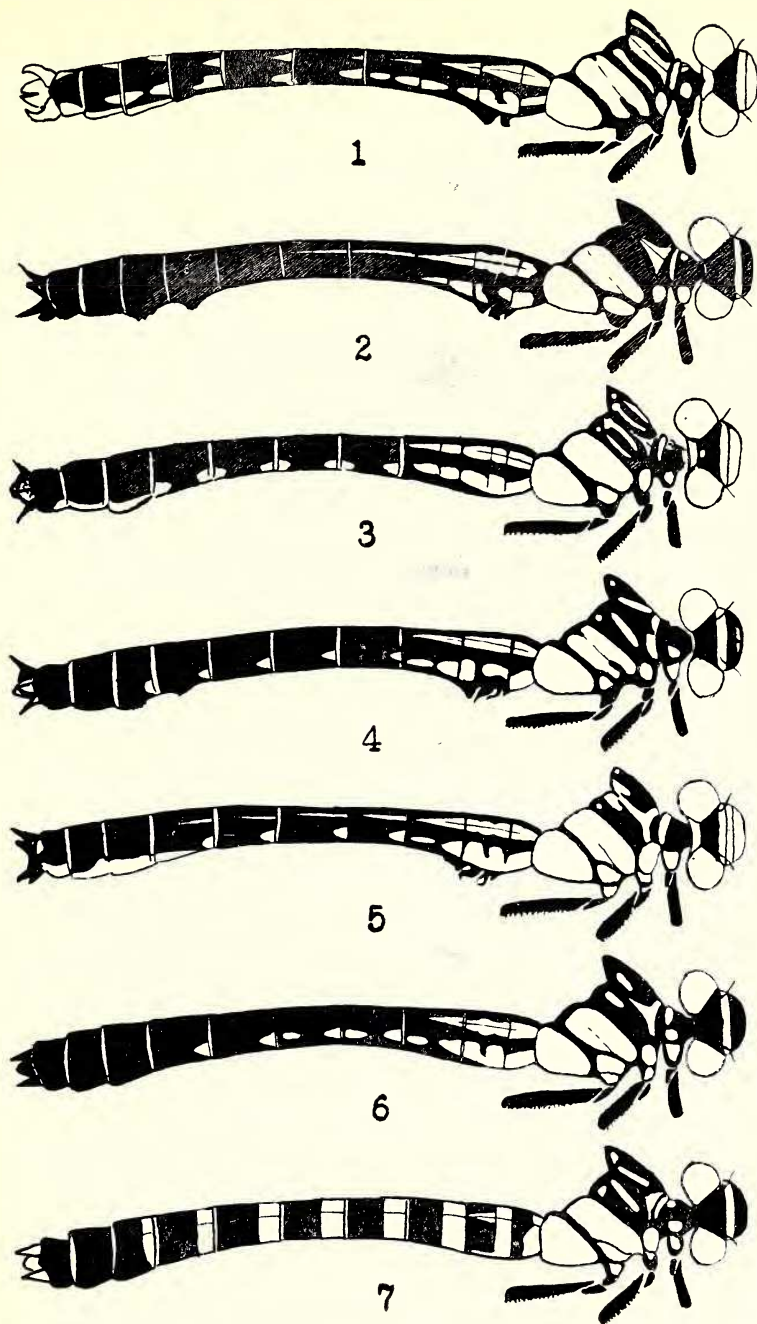
Vulvar scale small triangular, about half the length of segment 9, slightly bifid at apex.

Distribution. A large number of both sexes collected by Mr. Chas. M. Inglis at Gangtok, Darjeeling District in the month of May.

Distinguished easily from *zallorensis zallorensis* by the thoracic markings and by the glossy black face. Possibly the face of the latter in fully adult specimens is darker than as described by Selys. Venation in both species identical. Type in B.M.

Davidius davidi davidi Selys, l.c., Will. l.c. Ris, l.c., Laid. l.c. (1922)

(Male unknown.) Female. Abdomen 34 mm. Hindwing 32 mm.



EXPLANATION OF PLATE.

DORSO-LATERAL VIEW OF:—

1. *Davidius aberrans* Selys, ♂
2. *Davidius davidi assamnesis* Laid. ♂
3. *Davidius zallorensis zallorensis* Selys. ♂
4. *Davidius zallorensis delineatus* subsp. nov. ♂
5. *Davidius malloryi* sp. nov. ♂
6. *Davidius davidi davidi* Selys. ♀
7. *Davidius kumaonensis* sp. nov. ♀

Head black except the frons, which has a broad dark yellow transverse stripe on its crest; occiput low, fringed with hair behind.

Prothorax black, its base and posterior lobe dark yellow.

Thorax black marked with yellow as follows:—a short unbroken mesothoracic collar, the lower part of the middorsal carina which is confluent with the yellow of the collar, an upper isolated cuneiform humeral spot and laterally two very broad yellow stripes separated by a narrow black stripe on the postero-lateral suture.

Interalar space also yellow.

Legs black, femora armed as in *zallorensis*, rather long, 8 mm.

Wings hyaline, slightly saffronated, costa black. Nodal index:—13/15–15/15; trigone of forewing entire traversed once in the hind; pterostigma blackish brown, 3 mm. long, stout, over $3\frac{1}{2}$ to 4 cells.

Abdomen black, dorsum of segment 1 and its sides, and a dorsal stripe and the sides of segment 2 yellow; segments 3 to 5 with baso- and apico-lateral yellow spots, 6 to 7 with basal spots only.

Anal appendages small, the length of segment 10, which is very short. Vulvar scale slightly notched.

Distribution. Thibet. Two females, one of which is the type, in the Paris Museum, collected by the Abbot David after whom the species is named.

Davidius davidi assamensis Luid. l.c. (1922).

Differs from the last by the total absence of the antehumeral cuneiform spot on thorax. In the male, the last five segments are unmarked. Segment 7 has on its ventral aspect, a little apicad to the middle of segment, a small tubercle-like process on the ventral tergite, coated with tiny backwardly directed spines. The sides on the 8th segment have a series of larger spines and the sternite has also a small obtuse projection close after the base.

The markings of the body are a rich ochreous rather than greenish or citron yellow as in other species.

Anal appendages very similar to those of *zallorensis*. Superiors as long as segment 10, conical, curled slightly up and bearing a stout hook-like basal branch beneath. Inferior triangular bifid at apex and furnished with a medial lateral spine on each side.

Venation corresponding to that of *zallorensis*, trigones of hindwings only, traversed. Wings hyaline, slightly enfumed at the bases.

Distribution. Gopaldhara, Sikhim, 1 male and 2 females in the Indian Museum, the male the type.

Davidius malloryi, sp. nov.

Male. Abdomen 29 mm. Hindwing 21–23 mm.

Head. Labium dirty brown or dirty yellow; labrum and face greenish yellow, unmarked; frons greenish yellow, its base above broadly black; vertex black; occiput greenish yellow, notched at the middle, fringed with long black hairs.

Prothorax black, its posterior lobe and a large subdorsal spot which is confluent with it, yellow.

Thorax black marked with greenish yellow as follows:—a very narrow mesothoracic collar confluent with a median dorsal stripe, which narrows above, and is confluent here with two subdorsal, longitudinally oval spots, the three markings together shaped like a 'T'.

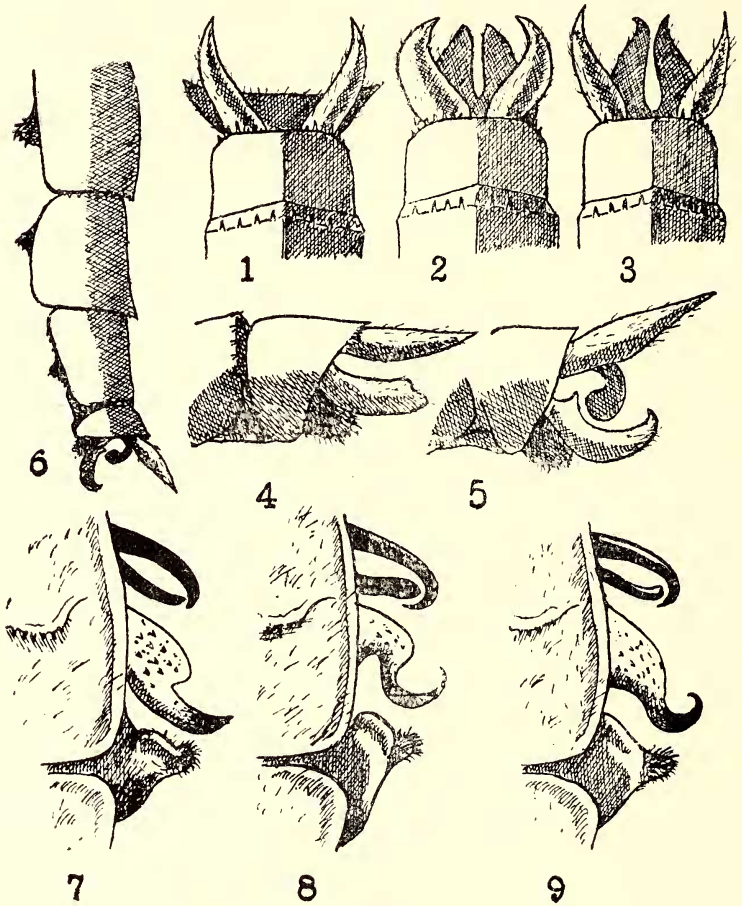
The extreme upper keeled part of the dorsal carina black, this alone separating the adjacent dorsal oval spots. A tiny upper ante-humeral point. Laterally greenish yellow with the postero-lateral suture very finely black, as is also the antero-lateral below the level of the spiracle. From this a line runs back to meet the posterior, thus forming a black, inverted 'Y'.

Legs black, femora armed as for genus, the distal spine considerably longer. The femora, underside and dorsum of thorax very hairy.

Wings hyaline, paly enfumed, not saffronated; pterostigma bright ochreous between heavy black nervures, braced, but the brace at an angle to the oblique end of pterostigma, over 3–4 cells, the hind pterostigma slightly the larger,

not nearly as swollen as in other species; Nodal index $\frac{8-11}{8-8}$ anal triangle with 3 cells; 2 cross nervures between *Mi-iii* and *Miv* in forewing. only 1 in the hind; only 1 cubital nervure in all wings; trigone in forewing always entire,

in the hindwing more often entire than traversed (entire in all wings in 2 specimens, traversed in one hindwing only in 3 specimens, in both hindwings in 2 specimens, in one hindwing and imperfectly in the other of another specimen).



Explanation of Fig. 3.

1. Dorsal view of anal appendages of *Davidius malloryi* sp. nov., ♂. 2. The same of *Davidius aberrans* Selys, ♂. 3. The same of *Davidius zallorensis delineatus* subsp. nov., ♂. 4. Lateral view of anal appendages of *Davidius zallorensis delineatus*, ♂. 5. The same of *Davidius zallorensis delineatus*, ♂. 6. Terminal segments of abdomen of *Davidius davidi assamensis* Laid., showing ventral processes seen from the side, ♂. 7. Genitalia of *Davidius malloryi* ♂. 8. The same of *Davidius zallorensis delineatus* ♂. 9. The same of *Davidius davidi assamensis*, ♂.

Abdomen black marked with yellow as follows :—segment 1 with a narrow middorsal stripe which is continued over segment 2 nearly to the apical border of segment 3, the sides of segments 1 to 3 broadly, including the oreillets on segment 2, after which the yellow is almost interrupted by an invasion of black from above. On segment 3 the lateral yellow broadly interrupted by the black jugal suture, segments 4 to 7 with small triangular basolateral spots, these segments also with the middorsal carina finely yellow, but not extending quite

to apex on 5 and 7, the latter segment with the ventral border narrowly yellow, 8 to 10 with this same border more broadly yellow, segment 10 with a dorso-apical spot, the intersegmental joints between the last four segments bright yellow.

Anal appendages black, the inferior yellow within. Superiors divaricate, conical, pointed, equal in length to segment 10 no basal ventral branch. Inferior deeply cleft into two branches which are more divaricate than the superior appendages are from one another, the branches rather tumid at the end, where each ends in a minute upturned point.

Genitalia. Lamina depressed; anterior hamules fine, long, black spines, markedly curled so that the points almost meet the stem again to enclose a fenestration, posteriors very robust, tumid, paler, sloping down and back, contracting rapidly near the apex into a short stout robust recurved spine; lobe inflated, funnel-shaped, glossy black.

Female. Abdomen 29 mm. Hindwing 24 mm.

Almost entirely similar to the male, abdominal markings rather more extensive, nodal index a little higher, trigone of hindwings traversed or entire. Vulvar scate triangular, slightly bifid, apex blunt.

Distribution. Assam. Several specimens, adult males and a single rather teneral female, collected by Mr. T. Bainbrigge Fletcher at Laitlyngkot, Khasia Hills, Assam, 21, iv. 24. The species is closely allied to *aberrans* by its appendages, but is easily distinguished from it, and from all other species by the remarkably specialized dorsal thoracic markings, unique in the family *Gomphidae*, and recalling the bizarre patterns of *Coellicia*.

The species was found settled flat on rocks and stones in the beds of rivers and lay so close that Mr. Fletcher states that he had to 'shovel them off with the rim of his net'. These habits closely correspond to those of *Burnagomphus*, a genus which most closely approaches the genus *Davidius*, at least in considering the Asiatic genera. The narrower pterostigma and the simple form of anal appendages might justify a removal of this species and *aberrans* to a separate genus. In their simple appendages they resemble *Burnagomphus* more closely than do other species of the genus.

I have named this interesting species after Mr. Mallory who so nobly laid down his life in the cause of science on the slopes of Mt. Everest.

Davidius aberrans aberrans Selys, (*Hagenius aberrans*), *Appendix au Troisième Add. au Syn. des Gomphines*, Bull. Acad. Belg. (2) xxxv, p. 62 (1873); Will. l. c. (1908); Laid. l. c. (1922).

Male. Abdomen 27 mm. Hindwing 25 mm.

Head. Labium, labrum and face entirely yellow; frons yellow, its base above narrowly black; vertex black; occiput yellow, sinuous, fringed with hairs.

Prothorax black, a large yellow spot on each side and the posterior lobe bright yellow.

Thorax black marked with bright greenish yellow as follows:—a short uninterrupted mesothoracic collar which is confluent with two almost confluent dorsal stripes, which lie close to and parallel with the middorsal carina, a sinuous, moderately narrow antehumeral stripe. Laterally broadly yellow, with the postero-lateral suture finely lined with black, lastly the remnants of a similar stripe on the anterior suture extending up as far only as the spiracle. The dorsal carina has some dark shading on each side.

Legs black, coxae yellow, femora armed as for genus with a row of closely-set, evenly-spaced spines, the last 3 or 4 slightly larger and less closely-set.

Wings hyaline, palely saffronated, diffusely so and of a deeper tint at the base; pterostigma reddish brown, swollen, short, broad, over 3 cells; 5 rows of postanal cells to hindwing, 3 cells in the anal triangle; trigones in forewing entire, traversed once in the hindwings; nodal index $\frac{10-10}{7-8} \frac{10-10}{8-7}$.

Abdomen black marked with yellow as follows:—a middorsal stripe on segment 1 which is continued over segment 2 to the basal half of 3, the sides of segments 1 and 2 broadly yellow including the oreillets, segment 3 with a subtriangular basolateral spot and a narrow linear subapical lateral spot, 4 with similar but much smaller spots, 5 and 6 with the basal spots only, 7 with a basolateral 'T' shaped spot, 8 with a linear lateral spot broken at the jugal suture and extending downwards at either end, 9 with a minute subbasal lateral

spot and its ventral border narrowly, 10 with a large lateral spot not quite reaching the base.

Anal appendages yellow, the superiors divaricate simple, equal in length to segment 10, unbranched, the apices pointed and turning a little inward; inferior appendage triangular, slightly bifid at the apex, which is blunt.

Genitalia. Lamina depressed, lobe tumid, corrugated but glossy black; posterior hamules very robust, ending in a short, stout, slightly upturned recurved spine which turns in towards its fellow.

Female. Abdomen 29 mm. Hindwing 27 mm.

Very similar to the male, differs as follows nodal index slightly higher; trigone of forewing traversed or entire; pterostigma slightly larger, over 4 to 5 cells and slightly larger in the hindwing than in the forewing. The vertex with a small median spot of yellow, occiput low, emarginate and with two prominences behind. Prothorax with a small geminate spot just in front of the posterior lobe (this probably present also in most males).

Distribution. Type a female in the MacLachlan collection, collected by Capt. Lang in North India. Allotype male in the Pusa collection, collected by Mr. T. Bainbrigge Fletcher at Muktesar, Kumaon, Assam, 7,000 ft. May 9, 1923.

The species differs from all others, except *malloryi*, by the simple nature of the anal appendages, and by its markings from *malloryi*. The two species are closely related but, I think, must be considered as distinct species rather than subspecies.

***Davidius aberrans senchalensis* subsp. nov.**

Female. (Male unknown). Abdomen 28 mm. Hindwing 27 mm.

This species closely resembles *aberrans aberrans*, but differs in the following particulars:—

The nodal index is higher $\frac{14-12}{12-10} \frac{12-12}{10-13}$, the face is black except for a fine obscure submarginal line of yellow on the labrum, and an obscure yellow line on the postclypeus. The occiput is indented on either side and is not emarginate. The humeral stripe is entirely absent. The trigones of the forewings are entire and the bases of all wings are markedly saffronated. The pterostigma in all wings is over only 4 cells. The abdominal markings differ in the following respects:—the dorsal stripe is arrested at the extreme base of segment 3, segments 3 to 7 have a basal and a subapical spot, on 3 and 4 the basal spot is elongate and dumbbell shaped, on 5 to 7 this spot is not dilated at the apical end and on segment 8 appears only a small baso-lateral spot and a smaller triangular dorsal spot at the base, 9 and 10 are unmarked.

Distribution. A single female from Senchal, Darjeeling district, 8,000 ft. May 19, 1924. The characteristic parallel middorsal thoracic stripes, almost confluent with the yellow middorsal carina, show a close relationship to *aberrans aberrans*, but with so many points of difference I do not think that they can possibly be conspecific.

***Davidius kumaonensis* sp. nov.**

Female. Abdomen 27 mm. Hindwing 22 mm.

Head. Labium dirty yellow, labrum black, face and frons glossy black, the upper surface and foreborder of latter greenish yellow, vertex and occiput black, the latter sinuous, notched at its middle.

Prothorax black, its posterior lobe, a geminate spot just in front of it, and a largish lateral spot yellow.

Thorax black marked with bright yellow as follows:—a very short but complete mesothoracic collar, oblique narrow antehumeral stripes not confluent with the collar, a small upper humeral spot, laterally almost entirely greenish yellow, the hinder suture finely mapped out in black.

Legs black, unmarked, hind femora with armature common to the genus.

Wings hyaline, slightly saffronated at the bases. Trigones of forewings entire, traversed usually in the hind; nodal index:— $\frac{13-13}{11-10} \frac{15-13}{10-11}$; pterostigma pale yellow, stout and short, over 3 cells, braced indifferently.

Abdomen black ringed with yellow as follows:—the basal half of segment 1 and 2, the latter with a prolongation along the dorsal carina and another along the ventral border, segments 3 to 8 with rather more than the basal third yellow but the ring narrowing considerably on segments 7 and 8,

segments 9 and 10 unmarked, the sutures between the last four segments bright yellow.

Anal appendages and the conical process between them yellow, short and conical. Vulvar scale small, in poor condition owing to the general condition of the specimens.

Distribution. Kumaon, 7,000 ft. in May, collected by Mr. T. Bainbrigge Fletcher. Two females, one of which is the type in the British Museum. It is unfortunate that no male was taken of this interesting species which is distinguished from all others by the broad rings on the abdomen. The markings on the thorax resemble closely those of *zallorensis delineatus*, but without the evidence of the male, it cannot be said whether they are at all closely related.

(To be continued.)